**COMPLIANCE CERTIFICATE FOR UNDERGRADUATE 2.0 POLICY**

**Program Name: \_\_\_\_\_\_BS DATA SCIENCE\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Program Scheme of Studies**

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| **Structure of the Scheme** |
| **Courses Credit Hours**  | 1-4 |
| **Core Courses:**(Credit Hours)   | 47 |
| **Foundation Courses:**(Credit Hours)   | 12 |
| **Major Courses:** (Credit Hours)   | 18 |
| **Technical Electives:** (Credit Hours)    | 21 |
| **General Electives:**(Credit Hours)  | 35 |
| **Supporting Science:** (Credit Hours)  | 0 |
| **University Electives:** (Credit Hours)   | 3 |
| **Undergraduate 2.0 courses**(Credit hours) | Distributed above |
| **Total Credit Hours:**  | **136** |

**Program Road Map**

**Applicable to Batch No. \_\_\_\_F2023332\_\_\_\_\_ Session \_\_\_\_\_F2023\_\_\_\_\_\_\_\_\_**

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| **1st Year** |
| **Fall Semester** (1ST) | **Spring Semester** (2ND) |
| **Code** | **Course Title** | **Cr. Hrs.** | **Prerequisite**  | **Code** | **Course Title** | **Cr. Hrs** | **Prerequisite** |
| CC111 | Programming Fundamentals | 3 |  | ISL112 | Islamic thought and perspectives | 3 |  |
| CC111L | Programming Fundamentals Lab | 1 |  | EN123 | English II | 3 | EN110 |
| MA107 | Calculus and Analytical Geometry | 3 |  | MA102 | Multivariable Calculus (DS Supporting 1) | 3 | MA107 |
| CC120 | Application of Information & Communication Technologies | 2 |  | CC112 | Object Oriented Programming | 3 | CC111, CC111L |
| CC120L | Application of Information & Communication Technologies | 1 |  | CC112L | Object Oriented Programming Lab | 1 | CC111, CC111L |
| EN110 |  English I | 3 |  | CC121 | Digital Logic Design | 2 |  |
| NS125 | Applied Physics | 2 |  | CC121L | Digital Logic Design Lab | 1 |  |
| NS125L | Applied Physics Lab | 1 |  | CC141 | Discrete Structures | 3 |  |
| POL121 | Pakistan: Ideology, Constitution, and Society | 3 |  |  |  |  |  |
| **Semester Credit Hours** | **19** |   | **Semester Credit Hours** | **19** |   |
| **2 Year** |
| **Fall Semester** (3rd) | **Spring Semester** (4th) |
| **Code** | **Course Title** | **Cr. Hrs.** | **Prerequisite**  | **Code** | **Course Title** | **Cr. Hrs** | **Prerequisite** |
| CC213 | Data Structures | 3 | CC112, CC112L | CC251 | Computer Networks | 2 |  |
| CC213L | Data Structures Lab | 1 | CC112, CC112L | CC251L | Computer Networks Lab | 1 |  |
| MA210 | Linear Algebra (DS Supporting 2) | 3 | MA107 | CC230 | Database Systems | 3 |  |
| SS103 | Civics and Community Engagement | 2 |  | CC230L | Database Systems Lab | 1 |  |
|  |  |  |  |  | Technical Elective 1 | 3 |  |
| CC222 | Computer Organization and Assembly Language | 2 | CC121, CC121L | HU201 | Professional Practices | 3 |  |
| CC222L | Computer Organization and Assembly Language Lab | 1 | CC121, CC121L |  | Univ. Elective 1 | 3 |  |
| CC281 | Software Engineering | 3 |  |  |  |  |  |
| MA150 | Probability and Statistics (DS Supporting 3) | 3 |  | DS291 | Introduction to Data Science | 2 | MA150 |
|  |  |  |  | DS291L | Introduction to Data Science Lab | 1 | MA150 |
| **Semester Credit Hours** | **18** |   | **Semester Credit Hours** | **19** |  |  |

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| **3rd Year** |
| **Fall Semester** (5th) | **Spring Semester** (6th) |
| **Code** | **Course Title** | **Cr. Hrs.** | **Prerequisite**  | **Code** | **Course Title** | **Cr. Hrs** | **Prerequisite** |
| CC323 | Operating Systems | 3 |  |  | Technical Elective 3 | 3 |  |
| CC323L | Operating Systems Lab | 1 |  | CC361 | Information Security | 3 |  |
|  | Technical Elective 2 | 3 |  | DS392 | Advanced Statistics | 3 | MA150 |
|  |  |  |  | SD101 | 21st Century | 0 |  |
| SD100 | English Immersion | 0 |  |  | Technical Elective 4 | 3 |  |
| MG365 | Innovation and entrepreneurship | 3 |  | EN220 | Technical & Business Writing | 3 | EN107 |
| DS393 | Data Mining | 2 | DS291, DS291L | DS395 | Data Warehousing & Business Intelligence | 3 | DS393, DS393L |
| DS393L | Data Mining Lab | 1 | DS291, DS291L |  |  |  |  |
| CC342 | Analysis of Algorithms | 3 | CC213, CC213L |  |  |  |  |
| CC371 | Artificial Intelligence | 3 | CC213, CC213L |  |  |  |  |
| **Semester Credit Hours** | **19** |  | **Semester Credit Hours** | **18** |   |
| **4th Year** |
| **Fall Semester** (7th) | **Spring Semester** (8th) |
| **Code** | **Course Title** | **Cr. Hrs.** | **Prerequisite**  | **Code** | **Course Title** | **Cr. Hrs** | **Prerequisite** |
|  | Technical Elective 5 | 3 |  |  | Univ. Elective 2 | 3 |  |
| CC425 | Parallel & Distributed Computing | 3 | CC323, CC323L |  | Technical Elective 7 | 3 |  |
|  | Technical Elective 6 | 3 |  | CC492 | Final Year Project – II/COOP2\* | 4 | CC491 |
| DS494 | Data Visualization | 2 | DS395 |  |  |  |  |
| DS494L | Data Visualization Lab | 1 | DS395 |  |  |  |  |
| CC491 | Final Year Project – I/COOP1\* | 2 |  |  |  |  |  |
| **Semester Credit Hours** | **14** |   | **Semester Credit Hours** | **10** |   |
|  |  |  | **Total credit hours** | **136** |  |

**\*COOP means FYP undertaken in the industry.**

**Total Credit Hours: 136**

**List of Electives (Add list of electives for this program)**

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|  | **Technical Electives**  | [**Cr.Hr**](http://cr.hr/)**.** |
| IT461 | Blockchain Technology and Application | 3(3-0) |
| DS 391 | Big Data Analytics | 3(3-0) |
| AI372 | Machine Learning | 3(2-1) |
| AI473 | Artificial Neural Networks & Deep Learning | 3(2-1) |
| CS324 | Human Computer Interaction | 3(3-0) |
| AI394 | Large Language Models | 3(3-0) |
| DS 492 | Topics in Data Science | 3(3-0) |
| AI 377 | Introduction to Robotics | 3(2-1) |
| AI374 | Knowledge Representation & Reasoning | 3(3-0) |
| AI391 | Natural Language Processing | 3(3-0) |
| AI378 | Agent-Based Modeling | 3(3-0) |
| CS393 | Mobile Application Development | 3(2-1) |
| IT291 | Web Technologies | 3(2-1) |
| IT352 | Internet of Things | 3(3-0) |
| CY361 | Cyber Security | 3(2-1) |
| SE494 | Open-Source Software Development | 3(2-1) |

**University Elective 1 (3 Credit Hours) (From Arts and Humanities)**

**Arts and Humanities (3 Credit Hours) Min One Course**

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| --- | --- | --- |
| **Course Code** | **Course** | **Cr. Hr.** |
| **SD221** | Life and Learning                     | **3** |
| **SD222** | Foreign Language | **3** |
| **SD223** | Logical Reasoning | **3** |

**University Elective 2 (3 Credit Hours) (From Social Sciences)**

**Social Sciences (3 Credit Hours) Min One Course**

|  |  |  |
| --- | --- | --- |
| **Course Code** | **Course** | **Cr. Hr.** |
| **HWB101** | Health and Wellbeing | **3** |
| **SOC102** | Understanding Society and Sociocultural Dynamics | **3** |
| **PSY110** | Psychology of Mind and Behavior | **3** |
| **ECO202** | Economics | **3** |
| **MK210** | Principles of Marketing | **3** |
| **MG120** | Principles of Management | **3** |

**Note:**

The program BS Data Science (BS-DS) is accredited by NCEAC. The roadmap must contain the courses provided by the NCEAC. Some of the courses we offer differ from those prescribed by UMT UG 2.0 but they are those that are mandated by NCEAC and do fulfill the requirements of the respective areas of UG 2.0. The roadmap is compliant with all the other courses proposed in UG 2.0.

**It is hereby certified that curriculum of \_\_\_\_\_\_\_BS Data Science\_\_\_\_\_\_\_\_ program, Session \_\_\_\_F2023\_\_\_\_\_\_\_ is compliant to Undergraduate 2.0 Policy. All the courses of UG 2.0 are incorporated in the roadmap accordingly.**

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**Chairperson of Department Dean concerned**

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**Director AAQIC Registrar**